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file 79-101

24 June 1954

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MEMORANDUM FOR: THE RECORD

SUBJECT : Report on Project P-101

1. Time and Place of Meeting: Monday, June 14, [REDACTED]

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2. Attendance: [REDACTED]

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3. Purpose: Project Monitor at [REDACTED]

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4. Discussion:

a. Evaluation of sources and sensitive elements

Present efforts are directed towards determining whether a xenon lamp would be a suitable source. Xenon's optical characteristics are extremely desirable, however its electrical properties may force its abandonment. The basic problem with xenon is to determine whether or not a suitable power unit can be built under existing space and weight considerations. The present xenon lamp (25 volts at about 1 - 1½ amps) requires a ballasted power supply and operates from approximately 75 watts. The lamp requires from 1 - 2 minutes warm up time and different lamps produce different characteristics when operated at the same conditions. This latter property would probably indicate the need of some sort of voltage controls.

b. Study of modulation methods and attendant optical systems

1) A study is under way to determine the practicability of electrically modulating the xenon source. Present thinking is directed towards the use of a series arrangement requiring approximately 15 watts of input power. This would yield about 75% modulation with a total power consumption of between 90 and 100 watts. This power requirement is very near the upper limit expected from the contemplated power source.

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2) The properties of a torsional system of mechanical modulation are currently being investigated. [REDACTED] recently acquired data from galvanometer manufacturers as regards mirror size, frequency response and sensitivity. His present thinking is that the torsional system of modulation would require the following:

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- a) a mirror size of .060 by .250
- b) 16° of maximum angular deflection for the mirror
- c) the coil of the galvanometer should be able to dissipate 5 watts of power

One manufacturer was able to approximately meet the first two specifications. However, difficulties will be encountered in designing a proper coil to dissipate the necessary power. Present coils are only rated for about .3 watt dissipation and because of inertia efforts, the problem will have to be solved without very much increasing the coil size. Other data regarding the sensitivity, distortion, power requirements and ruggedness of the torsional system of modulation is being collected and evaluated.

c. Determination of beam width requirements and evaluation of "find operate" systems

There is little progress to report about this phase of the system. Raytheon is awaiting topographic maps of the Chicago area before beginning field tests on the proposed "find operate" system. Results from these tests may yield conclusive data regarding

- 1) necessary transmitter band width
- 2) receiver band width
- 3) required area of uncertainty
- 4) "find operate" time

Based on laboratory work in their dark room and using a horizontal angle of uncertainty of plus or minus 5° and a vertical angle of uncertainty of plus or minus 2° , the following table was calculated.

T.B.W. degrees	R.B.W. degrees	# of scans	Time for Scans* seconds	# of posi- tions	Total time seconds
5x2	1	4	16	4	64
5x1	1	4	16	8	128
4x1	1	4	16	12	192
3x1	$\frac{1}{2}$	8	32	12	384
$2\frac{1}{2}$ x1	$\frac{1}{2}$	8	32	16	512
2x1	$\frac{1}{2}$	8	32	20	640
1x1	$\frac{1}{2}$	8	32	40	1280

* - Based on 4 secs/scan

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d. Evaluation of power sources

The present system of using a modified airplane engine as the primary power source is today still far from satisfactory. Besides the noise problem involved, the engine presents a difficult starting problem. Raytheon will ask the advice of the airplane engine manufacturer on starting its engine and will most likely take the muffling problem to Maxim.

e. Study of required circuit characteristics

The infinite clipping system of transmitting intelligence is currently under study. The breadboard circuitry is complete and by the end of the month, it is hoped to have the system evaluated.

4. Actions:

- a. will conduct field tests on the "find operate" system.
- b. will continue the collection of data in order to evaluate the various phases of the system.

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